

Reading Preview

Key Concepts

- In what ways is biodiversity valuable?
- What factors affect an area's biodiversity?
- Which human activities threaten biodiversity?
- How can biodiversity be protected?

Key Terms

- biodiversity • keystone species
- gene • extinction
- endangered species
- threatened species
- habitat destruction
- habitat fragmentation
- poaching • captive breeding

Target Reading Skill

Building Vocabulary After you read this section, reread the paragraphs that contain definitions of Key Terms. Use all the information you have learned to write a meaningful sentence using each Key Term.



Discover Activity

How Much Variety Is There?

1. You will be given two cups of seeds and two paper plates. The seeds in cup A represent the trees in a section of tropical rain forest. The seeds in cup B represent the trees in a section of deciduous forest.
2. Pour the seeds from cup A onto a plate. Sort the seeds by type. Count the different types of seeds. This number represents the number of different kinds of trees in that forest.
3. Repeat Step 2 with the seeds in cup B.
4. Share your results with your class. Use the class results to calculate the average number of different kinds of trees in each type of forest.

Think It Over

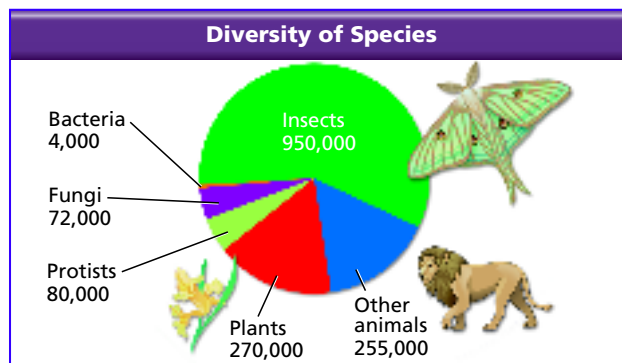
Inferring How do the variety of trees in the two forests differ? Can you suggest any advantages of having a wide variety of species?



No one knows exactly how many species live on Earth. As you can see in Figure 7, more than 1.5 million species have been identified so far. The number of different species in an area is called its **biodiversity**. It is difficult to estimate the total biodiversity on Earth because many areas of the planet have not been thoroughly studied. Some experts think that the deep oceans alone could contain 10 million new species! Protecting biodiversity is a major environmental issue today.

FIGURE 7

Organisms of many kinds are part of Earth's biodiversity. **Interpreting Data** Which group of organisms has the greatest number of species?



Objectives

After this lesson, students will be able to

- E.3.3.1** Explain the value of biodiversity.
E.3.3.2 Identify the factors that affect biodiversity.
E.3.3.3 Name some human activities that threaten biodiversity.
E.3.3.4 List some ways to protect biodiversity.

Target Reading Skill

Building Vocabulary Explain that knowing the definitions of key-concept words helps students understand what they read.

Answers

As students read each passage that contains a Key Term, remind them to write a sentence in their own words. Encourage students to write one or two descriptive phrases to help them remember the Key Term. Invite students to share their sentences and phrases.

Preteach

Build Background Knowledge

Millions of Different Species

Ask: **What organisms thrive in our area?** (Encourage students to consider a wide variety of organism types, including insects, worms, mosses, algae, and bacteria, as well as mammals, birds, fish, reptiles, and amphibians.) After students have finished naming organisms, ask: **Would you say that there is a great deal of diversity among the species living here?** (Answers may vary, but in most cases, students will say that there is.)



Discover Activity

Skills Focus Inferring

Materials 2 labeled cups containing different seed mixtures, paper plate

Time 20 minutes

Tips Use a mixture of at least ten types of seeds for Cup A and four or five types for Cup B. Advise students to record their observations in a table with headings "Number of Seeds in Rain Forest,"

L1

Sample A" and "Number of Seeds in Deciduous Forest, Sample B."

Expected Outcome The average number of seed types will be greater for the tropical rain forest sample.

Think It Over The wider variety of tree species in a tropical rain forest supports a wider variety of other organisms that depend on the trees for habitat and food.

Monitor Progress

Answer

Figure 7 Insects

Instruct

The Value of Biodiversity

Teach Key Concepts

L2

Economic Value of Biodiversity

Focus Have students describe the different organisms living in some of their favorite areas. Ask: **Would you enjoy this area as much if it didn't have as many different species?**

Teach Tell students that biodiversity is a source of beauty and economic value of any area. Ask: **How can entire ecosystems, such as rain forests, savannas, and mountain ranges, be used to generate sources of money?** (*They can be used for ecotourism, which creates jobs and brings in money from people who visit the sites.*)

Extend Ask: **What might happen if the biodiversity of some of these ecosystems is disrupted?** (*Possible answers: Other species might die out; the area might not be as attractive to tourists.*) **How might this effect the economy of the area?** (*Fewer people might visit the sites, resulting in loss of jobs and revenue.*) **Learning modality:** logical/mathematical

Independent Practice

L2

All in One Teaching Resources

- [Guided Reading and Study Worksheet: Biodiversity](#)



Student Edition on Audio CD



FIGURE 8

Economic Value of Biodiversity
The biodiversity in rainforests and other ecosystems can have great economic value. Rain forest organisms are a source of many products, including latex paints. Ecosystem tourism in countries such as Costa Rica provides many jobs for local people.

The Value of Biodiversity

Perhaps you are wondering why biodiversity is important. Does it matter whether there are 50 or 5,000 fern species in some faraway rain forest? Is it necessary to protect every one of these species?

There are many reasons why preserving biodiversity is important. The simplest reason to preserve biodiversity is that wild organisms and ecosystems are a source of beauty and recreation. **In addition, biodiversity has both economic value and ecological value within an ecosystem.**

Economic Value Many plants, animals, and other organisms are economically valuable for humans. In addition to providing people with food, these organisms supply raw materials for clothing, medicine, and other products. No one knows how many other useful species have not yet been identified.

The ecosystems in which organisms live are economically valuable, too. For example, many companies now run wildlife tours in rain forests, savannas, mountain ranges, and other locations. This ecosystem tourism, or ecotourism, is an important source of jobs and money for such nations as Brazil, Costa Rica, and Kenya.



Modeling Keystone Species

L2

Materials model architectural building blocks or photograph of arch with keystone

Time 5–10 minutes

Focus Point out that an architectural keystone helps to maintain the structural integrity of an architectural feature.

Teach Use model architectural building blocks to construct an arch with a keystone. If such blocks are unavailable, use a photograph of an arch with a keystone. Point out the keystone, and ask: **What do you predict will happen if I remove this block?** (Some may predict that the arch will fall.) Remove the keystone to confirm students' predictions. Explain that the block you removed is called a keystone.

Apply Ask: **Why is a keystone a useful analogy for a keystone species?** (When a keystone species is removed, the entire ecosystem may collapse.) **learning modality:** visual



FIGURE 9

Ecological Value of Biodiversity

These sea stars in the Pacific Ocean near Washington and this sea otter near the California coast are both keystone species in their ecosystems. If the population of a keystone species drops too far, the entire ecosystem can be disrupted.

Relating Cause and Effect
How do sea otters help keep their ecosystem in balance?



Ecological Value All the species in an ecosystem are connected to one another. Species may depend on each other for food and shelter. A change that affects one species will surely affect all the others.

Some species play a particularly important role in their ecosystems. A **keystone species** is a species that influences the survival of many other species in an ecosystem. For example, the sea stars in Figure 9 prey mostly on the mussels that live in tide pools. When researchers removed the sea stars from an area, the mussels began to outcompete many of the other species in the tide pool. The sea star predators had kept the population of mussels in check, allowing other species to live. When the sea stars disappeared, the balance in the ecosystem was destroyed.

The sea otter in Figure 9 is another keystone species. In the 1800s, hunters killed most of the sea otters on the Pacific coast for fur. With the sea otters nearly extinct, the sea urchins they preyed on reproduced uncontrollably. The huge population of sea urchins ate all of the kelp. When sea otters were reintroduced into the ecosystem, they preyed on the sea urchins. With fewer sea urchins, the kelp population began to recover.



What is a keystone species?

Go online
PLANET DIARY

For: More on biodiversity
Visit: PHSchool.com
Web Code: ced-5033

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Visit: PHSchool.com
Web Code: ced-5033

Students can review biodiversity in an online activity.

Monitor Progress

L2

Oral Presentation Have each student present reasons why biodiversity is important to plant and animal species.

Answers

Figure 9 Sea otters prey on and help control the population of sea urchins. If the number of sea otters decreases dramatically, the number of sea urchins increases. The sea urchins are then in a position to eat all the kelp in an area.



A species that influences the survival of many other species in the same ecosystem

Factors Affecting Biodiversity

Teach Key Concepts

Identifying Factors

Focus Remind students that climate is the typical weather pattern—precipitation and temperature—of an area over a long period.

Teach Ask: Which area is more likely to have greater biodiversity—a tropical rain forest or an area closer to Earth’s poles? (A rain forest) **Why?** (Plants there can grow year-round, making food available all year to other organisms.) **Why does a coral reef have such a diverse ecosystem?** (A coral reef supports many different niches.)

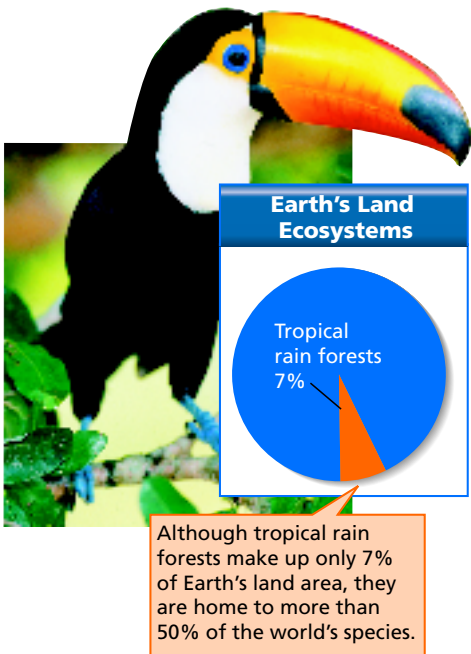
Apply Ask: What might happen to the biodiversity of an area if its climate becomes colder? (Its biodiversity might decrease.) **learning modality:** verbal

Help Students Read

Relate Text and Visuals After students have read about factors affecting biodiversity, call their attention to the circle graphs accompanying Figure 10. Ask: How much of Earth’s land area is made up of rain forests? (7 percent) What percentage of Earth’s species are found there? (50 percent) What explanation can you give to explain how such a small percentage of Earth’s land can be home to such a large percentage of species? (Rain forests have a climate that allows plants to grow all year and provide many different habitats.) **learning modality:** logical/mathematical

FIGURE 10
Land and Ocean Ecosystems

Three factors that affect the biodiversity of an ecosystem are area, climate, and niche diversity. **Making Generalizations** Which factor is most likely responsible for the biodiversity of coral reefs? Of tropical rain forests?



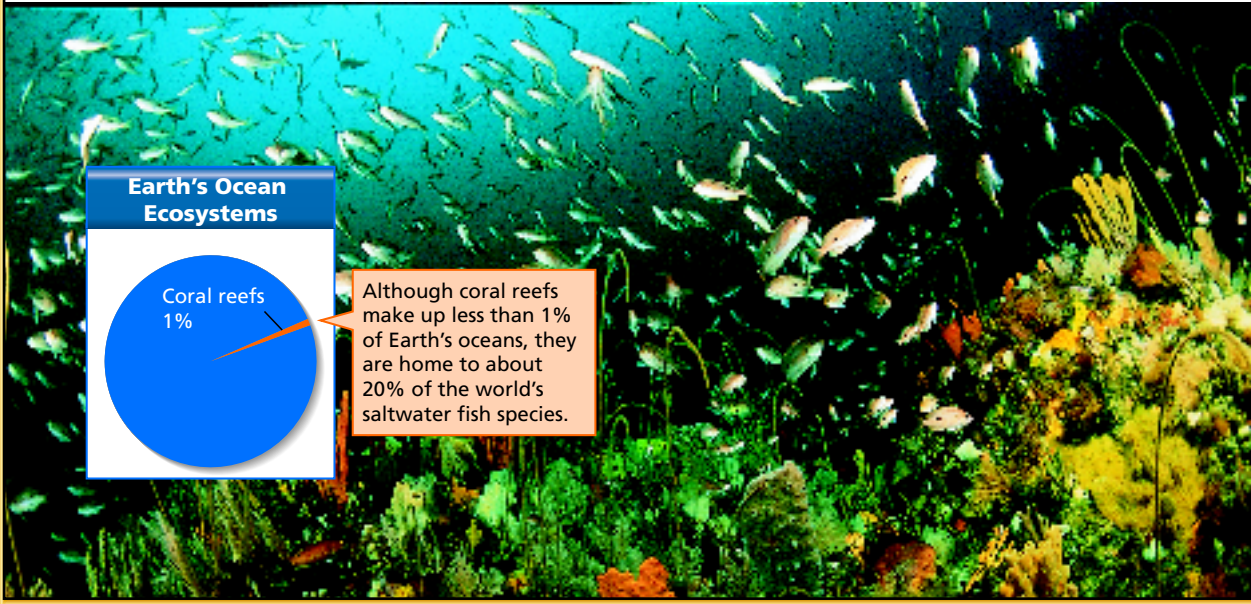
Factors Affecting Biodiversity

Biodiversity varies from place to place on Earth. **Factors that affect biodiversity in an ecosystem include area, climate, and diversity of niches.**

Area Within an ecosystem, a large area will contain more species than a small area. For example, suppose you were counting tree species in a forest. You would find far more tree species in a 100-square-meter area than in a 10-square-meter area.

Climate In general, the number of species increases from the poles toward the equator. The tropical rain forests of Latin America, southeast Asia, and central Africa are the most diverse ecosystems in the world. These forests cover only about 7 percent of Earth's land surface but contain more than half of the world's species.

The reason for the great biodiversity in the tropics is not fully understood. Many scientists hypothesize that it has to do with climate. For example, tropical rain forests have fairly constant temperatures and large amounts of rainfall throughout the year. Many plants in these regions grow year-round. This continuous growing season means that food is always available for other organisms.



Differentiated Instruction

Less Proficient Readers

Words in Context For students who need more help, review the meanings of the terms *area* (length times width), *climate* (the typical weather pattern in an area over

L1

a long period), and *niche* (an organism's unique position in an ecosystem). Students may wish to add these terms, and their definitions, to their own Science Glossaries.

Niche Diversity Coral reefs make up less than 1 percent of the oceans' area. But reefs are home to 20 percent of the world's saltwater fish species. Coral reefs are the second most diverse ecosystems in the world. Found only in shallow, warm waters, coral reefs are often called the rain forests of the sea. A reef supports many different niches for organisms that live under, on, and among the coral. This enables more species to live in the reef than in a more uniform habitat, such as a flat sandbar.

Gene Pool Diversity

Just as the diversity of species is important within an ecosystem, diversity is also important within a species. The organisms in a healthy population have a diversity of traits. Traits such as color, size, and ability to fight disease are determined by genes. **Genes** are the structures in an organism's cells that carry its hereditary information.

Organisms receive a combination of genes from their parents. Genes determine an organism's characteristics, from its size and appearance to its ability to fight disease.

The organisms in one species share many genes. But each organism also has some genes that differ from those of other individuals. These individual differences make up the total gene "pool" of that species.

Species that lack a diverse gene pool are less able to adapt to changes in the environment. For example, some food crops have little diversity. A fungus once wiped out much of the corn crop in the United States. Fortunately, some wild varieties of corn have genes that make them resistant to the fungus. Scientists were able to use some of those wild varieties to breed corn that could fight off the fungus. A species with a diverse gene pool is better able to survive such challenges.



What do an organism's genes determine?

FIGURE 11

Genetic Diversity

Diverse genes give these potatoes their rainbow of colors. Having a diverse gene pool helps a species fight disease and adapt to changes in its environment.



Lab zone Try This Activity

Grocery Gene Pool

With a parent or other adult, visit a supermarket or produce market in your area. Choose one type of fruit or vegetable, such as apples or potatoes. Make a list of all the different varieties of that fruit or vegetable the store sells. Note any differences in appearance between the varieties.

Inferring Judging from the appearance of the different varieties, do you think your fruit or vegetable has a diverse gene pool? Explain.

Gene Pool Diversity

Teach Key Concept

L2

Diversity and Survival of Species

Focus Ask students how dogs of the same breed might vary. (*Possible answers: Color, coarseness of fur, size*) Tell students that these are only some of the ways a species can vary.

Teach Tell students that genes determine some of an organism's characteristics. Ask: **What is the gene pool of a species?** (*The individual differences resulting from differences in genes between individuals in a species*)

Apply Ask: **How does having a diverse gene pool enable a species to survive changes in the environment?** (*It is likely to have members with characteristics needed in the changing environment.*) **learning modality: logical/mathematical**



Build Inquiry

L2

Comparing Biodiversity

Materials photographs of ecosystems

Time 15 minutes

Focus Review with students factors that affect biodiversity: area, climate, niche diversity.

Teach Give each pair of students a picture of a different type of ecosystem. Have them analyze the pictures to determine the number and types of organisms shown. Then have students describe the abiotic factors in the ecosystem.

Apply Have students compare the ecosystems to determine which have the greatest biodiversity. Help students identify factors that most likely contribute to the diversity. **learning modality: logical/mathematical**

Monitor Progress

L2

Writing Have students write a paragraph explaining why gene pool diversity is so important to species' survival.

Answers

Figure 10 Coral reefs—niche diversity; tropical rain forests—climate



Characteristics, such as size, appearance, and ability to fight disease



Try This Activity

Skills Focus Inferring

Materials none

Time 20 minutes

Tips Each variety of fruit or vegetable will be labeled. Suggest that students take notes as they note differences in appearance.

L1

Expected Outcome Generally, students will infer that the chosen produce has a diverse gene pool.

Extend Suggest students ask the produce manager why the store offers so many varieties. **learning modality: visual**

Extinction of Species

Teach Key Concepts

L2

Endangered Species

Focus Remind students that not all species of organisms that once lived are still living.

Teach Ask: **What is extinction?** (*The disappearance of all members of a species*)
How do threatened species differ from endangered species? (*Endangered species are in danger of becoming extinct in the near future. Threatened species could become endangered in the near future.*)

Apply Ask: **What similar problem has caused the populations of California tiger salamanders and grizzly bears to decrease?** (*Destruction of natural habitat*) **learning modality: visual**

Help Students Read

Use Prior Knowledge Before students read “Extinction of Species,” have them work in groups to brainstorm what they know about extinct species, including examples of extinct organisms and causes of extinction. After reading, have groups review their lists and determine how accurate their knowledge of extinction was.

Extinction of Species

The disappearance of all members of a species from Earth is called **extinction**. Extinction is a natural process. But in the last few centuries, the number of species becoming extinct has increased dramatically.

Once the size of a population drops below a certain level, the species may not be able to recover. For example, in the 1800s, there were millions of passenger pigeons in the United States. People hunted the birds, killing many hundreds of thousands. This was only part of the total population. But the remaining birds could not reproduce enough to sustain the population. Only after 1914, when the species became extinct, did people realize that the species could not survive without its enormous numbers.

FIGURE 12
Endangered Species

A broad range of species and habitats are represented on the endangered list in the United States.



◀ **Tennessee Purple Coneflower**
These daisy-like plants grow only in cedar forests in central Tennessee. Conservation organizations and landowners are working together to protect these plants.



California Tiger Salamander ▲
Towns have replaced much of this salamander’s habitat. The salamanders that remain are in danger of being run over by cars or washed down storm drains.



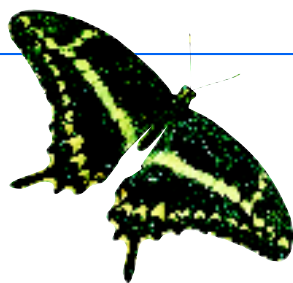
◀ **Grizzly Bear**
This omnivore needs a large area to obtain enough food. Shrinking wilderness areas have limited its numbers.

Species in danger of becoming extinct in the near future are called **endangered species**. Species that could become endangered in the near future are called **threatened species**. Threatened and endangered species are found on every continent and in every ocean.

Some endangered or threatened species are well-known animals, such as the tiger or China's giant panda. Others are little known, such as hutias, rodents that live on only a few Caribbean islands. Ensuring that these species survive is one way to protect Earth's biodiversity.

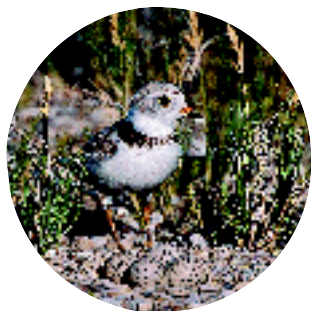


How has the number of species becoming extinct changed in the last few centuries?



▲ **Schaus Swallowtail Butterfly**

Threatened by habitat loss and pesticide pollution in the Florida Keys, this butterfly was nearly wiped out by Hurricane Andrew in 1992.



◀ **Piping Plover**

The population of this tiny coastal bird is recovering as a result of increased protection of its sand-dune nesting sites.

Steller's Sea Lion ▶

Overfishing has led to a decline in this mammal's sources of food. Other factors may also be threatening this species.



▶ **Whooping Crane**

Threatened by habitat destruction and disease, about half of the remaining whooping cranes are in zoos. The species is recovering well since its lowest point in the 1940s.



Address Misconceptions L2

Newly Extinct Species

Focus Students usually consider extinction as an event that occurred only in the distant past. Explain to students that many species have become extinct in relatively recent times.

Teach Provide students with a list of species that have become extinct within the past 300 years. Examples include the quagga, dodo, moa, Tasmanian wolf (thylacine), dusky seaside sparrow, Santa Barbara song sparrow, Greek auk, Hawaii oo, passenger pigeon, Abington tortoise, blue pike, Tecopa pupfish, and Sampson's pearly mussel. Invite pairs of students to research one of these species. Suggest that students find a description of the species and its habitat and the factors that researchers believe caused the extinction.

Apply Have students create an Extinction Timeline that contains information about all the species students have researched.

Differentiated Instruction

English Learners/Beginning

L1

Comprehension: Ask Questions Help students understand the difference between endangered and threatened species. Ask: **What does it mean to be “in danger”?** **What do you do when you are threatened?** Help students relate the answers to the questions to the meaning of the terms. **learning modality: verbal**

English Learners/Intermediate

L2

Comprehension: Ask Questions Have students read the sentences containing the phrases *endangered species* and *threatened species*. Ask whether students can describe the difference between the two, and help them clarify the meanings. **learning modality: verbal**

Monitor Progress L2

Skills Check Have students explain how endangered species differ from threatened species.

Answer



It increased in the last few centuries.



Discovery
CHANNEL
SCHOOL
Video
Field Trip

Living Resources

Show the Video Field Trip to let students experience the world of commercial fishers and understand how aquaculture is helping preserve the world's fish supply. Discussion question: **What is the difference between a fishery and a fish farm?** (*Fisheries are areas of ocean that are home to populations of valuable ocean organisms. A fish farm is a small regulated area in which managers control the environment.*)

Causes of Extinction

Teach Key Concepts

Human Causes of Extinction

Focus Tell students that extinction can result from natural causes and human causes.

Teach Ask: **How does habitat fragmentation contribute to extinction?** (*It can expose trees to wind damage; animals may not be able to find enough resources in a small area.*) **What is the illegal removal of wildlife species called?** (*Poaching*) **How does pollution contribute to species extinction?** (*Pollution can weaken individuals, kill them, or cause birth defects.*)

Apply Ask: **How does bringing exotic species into a country threaten biodiversity?** (*Some exotic species compete with native species for resources.*) **learning modality: logical/mathematical**

L2



Causes of Extinction

A natural event, such as an earthquake or a volcanic eruption, can damage an ecosystem, wiping out populations or even species. **Human activities can also threaten biodiversity.** These activities include **habitat destruction**, **poaching**, **pollution**, and the **introduction of exotic species**.

Habitat Destruction The major cause of extinction is **habitat destruction**, the loss of a natural habitat. This can occur when forests are cleared to build towns or create grazing land. Plowing grasslands or filling in wetlands greatly changes those ecosystems. Some species may not be able to survive such changes to their habitats.

Breaking larger habitats into smaller, isolated pieces, or fragments, is called **habitat fragmentation**. For example, building a road through a forest disrupts habitats. This makes trees more vulnerable to wind damage. Plants may be less likely to disperse their seeds successfully. Habitat fragmentation is also very harmful to large mammals. These animals usually need large areas of land to find enough food to survive. They may not be able to obtain enough resources in a small area. They may also be injured trying to cross to another area.

Poaching The illegal killing or removal of wildlife species from their habitats is called **poaching**. Many endangered animals are hunted for their skin, fur, teeth, horns, or claws. Hunters sell the animals they kill. The animal parts are then used for making medicines, jewelry, coats, belts, and shoes.

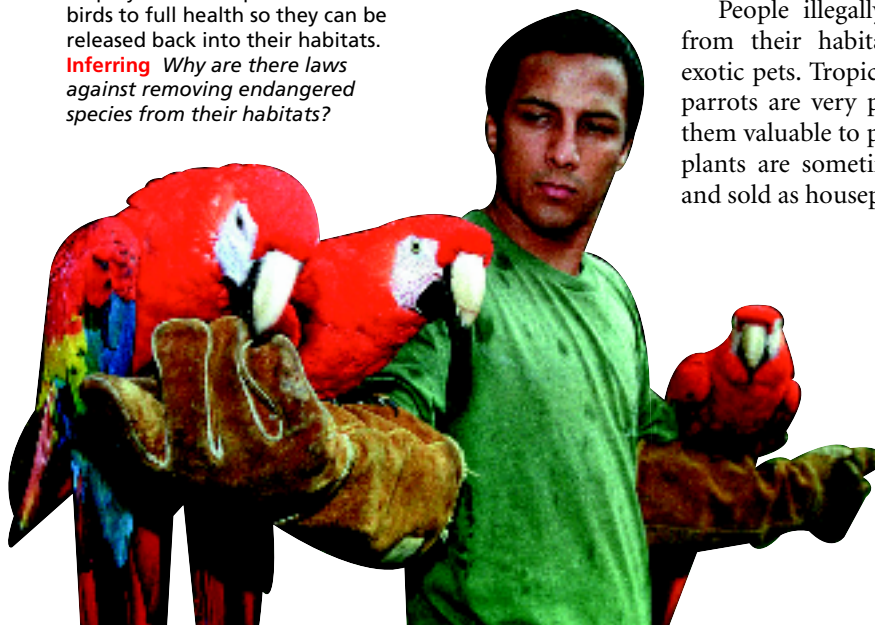
People illegally remove organisms from their habitats to sell them as exotic pets. Tropical fish, tortoises, and parrots are very popular pets, making them valuable to poachers. Endangered plants are sometimes illegally dug up and sold as houseplants or medicines.

FIGURE 13

Poaching

These scarlet macaws at a zoo in Costa Rica were rescued from poachers who were exporting macaws illegally as pets. Zoo employees will help restore the birds to full health so they can be released back into their habitats.

Inferring Why are there laws against removing endangered species from their habitats?

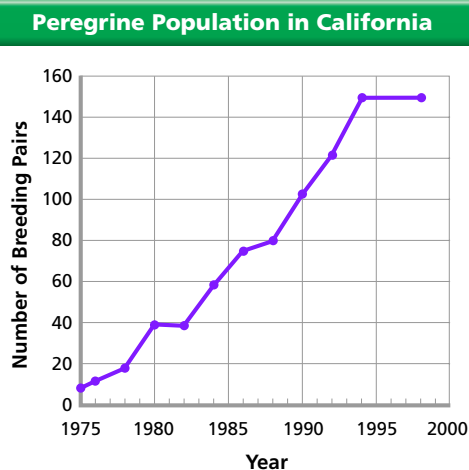


Math Analyzing Data

California Peregrine Falcon Recovery

The peregrine falcon, the world's fastest bird of prey, was nearly extinct in the United States in 1970. The pesticide DDT was weakening peregrine eggshells, so the eggs rarely hatched. In 1972, the United States banned DDT. Use the graph to answer questions about the peregrine population in California.

- Reading Graphs** What variable is plotted on the x-axis? What variable is plotted on the y-axis?
- Interpreting Data** How did California's peregrine population change from 1976 to 1998?
- Inferring** Why do you think the peregrine population grew fairly slowly at first?



- Predicting** What might this graph have looked like if DDT had not been banned?

Pollution Some species are endangered because of pollution. Substances that cause pollution, called pollutants, may reach animals through the water they drink or air they breathe. Pollutants may also settle in the soil. From there, they are absorbed by plants and build up in other organisms through the food chain. Pollutants may kill or weaken organisms or cause birth defects.

Exotic Species Introducing exotic species into an ecosystem can threaten biodiversity. When European sailors began visiting Hawaii hundreds of years ago, rats from their ships escaped onto the islands. Without any predators in Hawaii, the rats multiplied quickly. They ate the eggs of the nene goose. To protect the geese, people brought the rat-eating mongoose from India to help control the rat population. Unfortunately, the mongooses preferred eating eggs to rats. With both the rats and the mongoose eating its eggs, the nene goose is now endangered.



What is poaching?

FIGURE 14

Kudzu

Kudzu is an exotic species that was introduced to the United States from Japan in 1876. It can grow up to 30 centimeters a day, so its vines can quickly strangle native trees and shrubs. It can also take over abandoned structures, such as this house in Georgia.



Math Analyzing Data

Math Skill Making and interpreting graphs

Focus Tell students that the recovery of the peregrine falcon population is represented by a line graph, the most useful graph for showing change over an interval of time.

Teach Remind students what the axes represent and how the grid is structured. Ask: **What information do you have at any point along the graph?** (*The number of breeding pairs of birds in a particular year*)

How can you determine how many breeding pairs existed in 1990? (*Follow the grid line for 1990 until it reaches the graph, then follow the grid line to the left. Read the number on the vertical axis: just over 100.*)

About how many breeding pairs existed in 1975? (*About 10*)

Answers

- Time interval in years is on the x-axis. Number of breeding pairs of peregrine falcons is on the y-axis.
- The population grew steadily, except for a brief drop around 1980, until 1994, when the number of breeding pairs remained the same for the four following years.
- There were only a few breeding pairs at first, so they could produce only a few birds. These, in turn, had to grow up before they had a chance to breed. As more pairs grew to breeding age, more and more birds could be produced.
- The graph probably would have sloped downward from left to right, possibly reaching zero breeding pairs.

Monitor Progress L2

Skills Check Call on students to identify and briefly explain the four causes of extinction presented in the text.

Answers

Figure 13 Removing an individual of an endangered species from its habitat subjects the individual to stress and risks, which may limit the individual's ability to thrive, thereby weakening the already endangered species.



The illegal killing or removal of a wildlife species from its habitat

Differentiated Instruction

Gifted and Talented

Species Competition Encourage students to research introduced species that compete with native species in the United States. Have them report on where competition is prevalent and consequences to the native species. Example species

L3

include purple loosestrife, kudzu, leafy spurge, flathead catfish, sea lamprey, zebra mussel, gypsy moth, fire ant, brown tree snake, and starling. Students can share their findings in a class discussion.

learning modality: verbal

Protecting Biodiversity

Teach Key Concepts

L2

Evaluating Approaches

Focus Remind students that biodiversity has both ecological and economic value within an ecosystem.

Teach Encourage students to share what they know about captive breeding programs in zoos and wildlife preserves. Then ask: **What are the advantages and disadvantages of this approach for protecting biodiversity?** (*Sometimes it is the only way to save a species. Captive breeding can be expensive.*) **What is one disadvantage of using laws and treaties to protect species?** (*Laws and treaties that have such a wide scope are sometimes difficult to enforce. The CITES treaty, for example, protects more than 800 species.*) **Why is setting aside wildlife habitats as parks an effective way to preserve biodiversity?** (*Protecting entire ecosystems ensures that many habitats are preserved, which contributes to diversity.*)

Apply How does setting aside large ecosystems as wildlife habitats protect species that live only in a small area of the ecosystem? (*Protecting whole ecosystems saves not only endangered species but also the species they depend on and those that depend on them.*) **Learning modality:** verbal

Help Students Read

Identifying Main Ideas

Refer to the Content Refresher, which provides guidelines for identifying main idea. Have students read the main topic sentence in bold type under the heading Protecting Biodiversity. Ask: **Given this topic sentence, what are the main ideas that you should look for in the selection?** (*How captive breeding, laws and treaties, and habitat preservation protect biodiversity*) After students read the selection, have students work in groups to create index cards with a brief explanation of how each factor protects biodiversity.

FIGURE 15

Captive Breeding

Captive breeding programs use a scientific approach to protect endangered species. California condor chicks raised in captivity need to learn what adult condors look like. Here, a scientist uses a puppet to feed and groom a chick. **Predicting** What sort of problems could animals raised by humans come upon when they are released into the wild?



FIGURE 16

A Protected Species

Laws against selling products made from endangered species have helped protect animals such as these ocelots. These small cats were once hunted nearly to extinction for their fur.

Protecting Biodiversity

Some people who work to preserve biodiversity focus on protecting individual endangered species. Others try to protect entire ecosystems, such as the Great Barrier Reef in Australia. **Three successful approaches to protecting biodiversity are captive breeding, laws and treaties, and habitat preservation.**

Captive Breeding Captive breeding is the mating of animals in zoos or wildlife preserves. Scientists care for the young, and then release them into the wild when they are grown.

Captive breeding was the only hope for the California condor, the largest bird in North America. Condors became endangered due to habitat destruction, poaching, and pollution. By 1984, there were only 15 California condors. Scientists captured all the condors and brought them to zoos to breed. Today, there are more than 200 California condors. Though successful, this program has cost more than \$20 million. You can see the drawback of captive breeding.

Laws and Treaties Laws can help protect individual species. In the United States, the Endangered Species Act prohibits trade in products made from threatened or endangered species. This law also requires the development of plans to save endangered species. American alligators and green sea turtles have begun to recover as a result of this law.

The most important international treaty protecting wildlife is the Convention on International Trade in Endangered Species. This treaty lists more than 800 threatened and endangered species that cannot be traded for profit. Treaties like this are difficult to enforce. Even so, this treaty has helped to protect many endangered species, including African elephants.

Habitat Preservation The most effective way to preserve biodiversity is to protect whole ecosystems. Protecting whole ecosystems saves not only endangered species, but also the species they depend upon and those that depend upon them.

Beginning in 1872 with Yellowstone National Park, the world's first national park, many countries have set aside wildlife habitats as parks and refuges. In addition, private organizations have purchased millions of hectares of endangered habitats throughout the world. Today, there are about 7,000 nature parks, preserves, and refuges in the world.

To be most effective, reserves must have the characteristics of diverse ecosystems. For example, they must be large enough to support the populations that live there. The reserves must contain a variety of niches. And of course, it is still necessary to keep the air, land, and water clean, control poaching, and remove exotic species.



What is the most effective way to preserve biodiversity?



FIGURE 17

Habitat Preservation

Preserving whole habitats is an effective way to protect biodiversity. Habitat preservation is the aim of national parks such as Yellowstone.

Monitor Progress L2

Skills Check Ask individual students to describe one way to protect biodiversity.

Answers

Figure 15 They may be unable to find food and feed themselves, they might be too trustful of humans, and they might not recognize their natural predators.



Preserving entire ecosystems

Assess

Reviewing Key Concepts

1. a. Biodiversity has both an economic and ecological value. **b.** Using the rain forest for ecotourism brings in money. Certain organisms may provide food or medicines for humans.

2. a. area, climate, niche diversity

b. Greater area, greater niche diversity, and year-round growing seasons and abundant rainfall all yield greater biodiversity. **c.** No; the tundra growing season is too short to be able to provide a year-round food source for organisms.

3. a. Habitat destruction, poaching, pollution, and introduction of exotic species **b.** Habitat fragmentation

4. a. Captive breeding, laws and treaties, habitat preservation **b.** Captive breeding is expensive. Laws and treaties are difficult to enforce. Preserved habitats must have characteristics of diverse ecosystems

c. Sample answer: Make certain exotic species are not accidentally introduced by visitors, campers, and boaters, limit travel by automobile to reduce pollution, and minimize the number of roads.

Reteach L1

As a class, list ways in which humans threaten biodiversity and ways humans preserve biodiversity.

All in One Teaching Resources

- [Section Summary: Biodiversity](#)
- [Review and Reinforcement: Biodiversity](#)
- [Enrich: Biodiversity](#)

Section 3 Assessment

Target Reading Skill Building Vocabulary Use your sentences to help answer the questions.

Reviewing Key Concepts

- a. Listing** What are two ways in which biodiversity is valuable?

b. Problem Solving What economic reasons could you give people in the rain forest for preserving the ecosystem?
- a. Identifying** What are three factors that affect the biodiversity in an ecosystem?

b. Explaining How does each of these factors affect biodiversity?

c. Developing Hypotheses Would you expect to find great biodiversity in the tundra biome? Why or why not?
- a. Listing** Name four human activities that can threaten biodiversity.

b. Applying Concepts Black bears are roaming through a new housing development in search of food, even though the housing development is still surrounded by forest. How can you account for the bears' behavior?

- a. Reviewing** What are three approaches to protecting biodiversity?

b. Relating Cause and Effect For each approach to protecting biodiversity, list at least one factor that might limit its success.

c. Making Judgments List some ways in which those limitations might be dealt with.



At-Home Activity

Species Refuges Obtain a map of your community or state. With a family member, identify any city, state, or national parks, reserves, or refuges in your area. Choose one location and find out whether there are endangered or threatened species living there. Then prepare a five-minute presentation for your class on what you learned.



Chapter Project

Keep Students on Track Remind students that they need to make notes about abiotic factors as well as notes on organisms. Encourage students to draw or sketch the organisms they observe in detail so that they will be able to identify them using field guides. Students should be beginning to plan how they will present their findings.



At Home Activity

Species Refuges L1 Students can contact their state's EPA, local Audubon Society, or parks department. Remind students that refuges near bodies of water may be used primarily by migrating species. Students' presentations should describe the habitats of endangered or threatened species in the area.